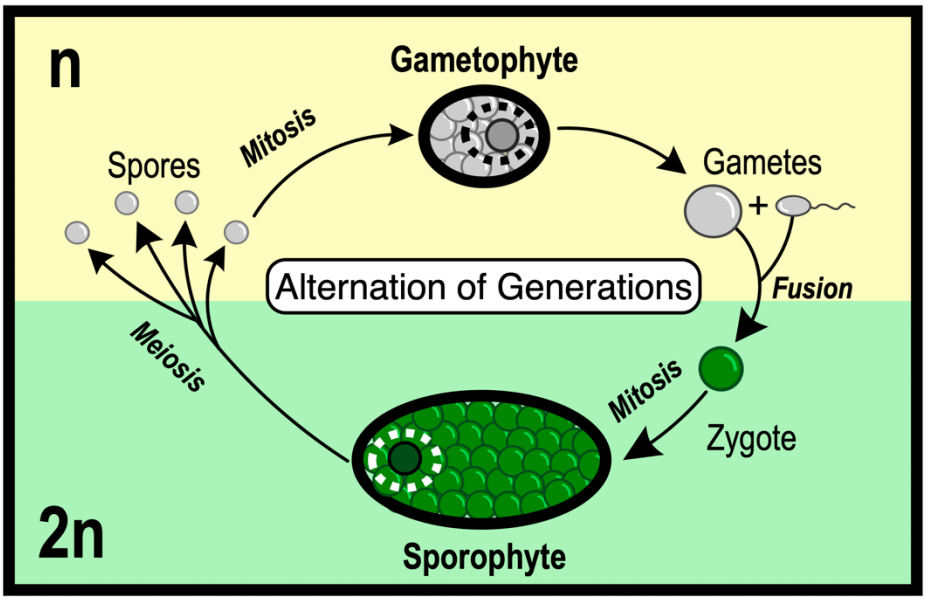
CONCEPT: ANGIOSPERM REPRODUCTION

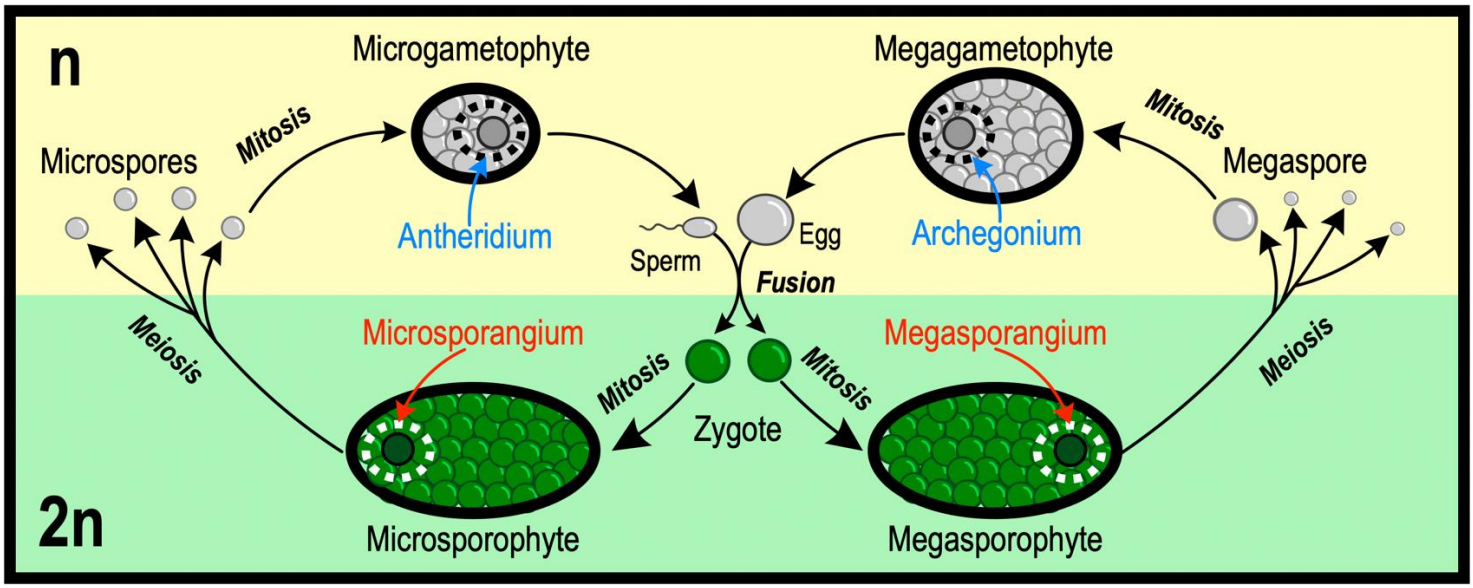
- Plant life cycles go through an ***alteration of generations*** between sporophytes and gametophytes
- Angiosperms are the most diverse and dominant group of land plants, and have a sporophyte-dominant life cycle
    - □ ***Sporophyte*** – diploid, multicellular stage of life cycle that produces spores by meiosis
        - ***Spore*** – unit of asexual reproduction, generally haploid and unicellular
    - □ ***Gametophyte*** – haploid, multicellular stage of life cycle that produces gametes by mitosis
        - Gametes fuse to form diploid zygote that becomes sporophyte

EXAMPLE:



- ***Heterospory*** – two distinct types of spores are produced
    - □ ***Microsporangium*** – produce microsporocytes that become microspores, and develop into male gametophytes
    - □ ***Megasporangium*** – produce megasporocytes that become megaspores, and develop into female gametophytes

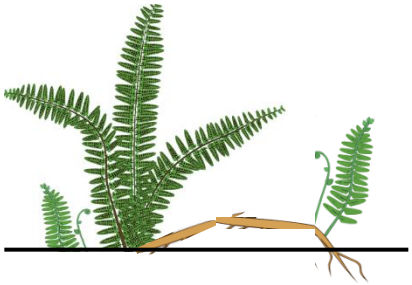
EXAMPLE:

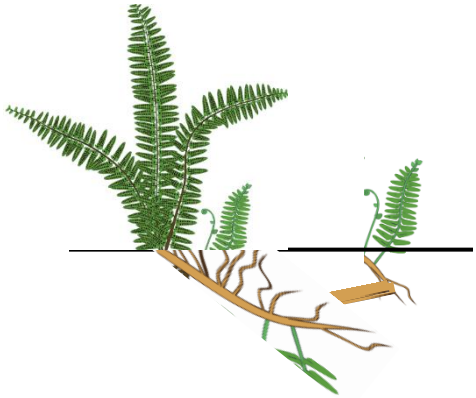


CONCEPT: ANGIOSPERM REPRODUCTION

- Many plants can perform asexual reproduction, or vegetative reproduction, by producing clones
    - □ Rhizomes – stems that form new individuals underground
    - □ Stolons – stems that form adventitious roots, and produce new individuals above ground
    - □ Apomixis – seeds form without fertilization, producing clone offspring
    - □ Fragmentation – individual is split into fragments which can develop into mature organisms
- Vegetative propagation – vegetative reproduction with human involvement, like cuttings with a callus that produces roots

EXAMPLE:





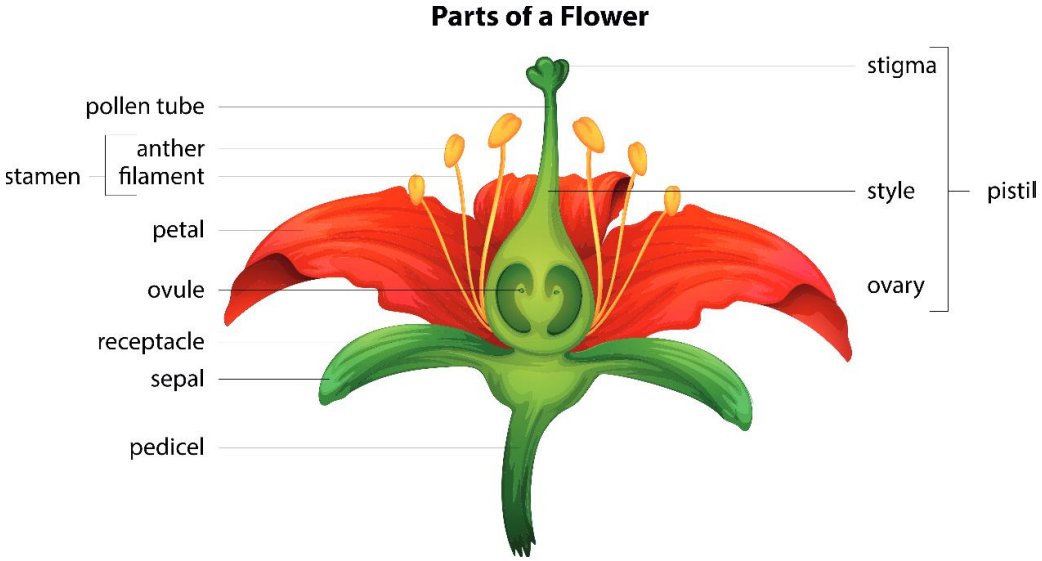
- Flowers are the reproductive structures of angiosperms that produce gametes, embryos, fruits, and seeds
- ***Sepal*** – serve as protection for the flower bud and support for the petals, usually green in appearance
    - □ ***Calyx*** – entire group of sepals, and cup-like structure
- ***Petals*** – modified leaves that surround the reproductive parts of the flower, often serve to attract pollinators
    - □ ***Corolla*** – entire group of petals

EXAMPLE:

CONCEPT: ANGIOSPERM REPRODUCTION

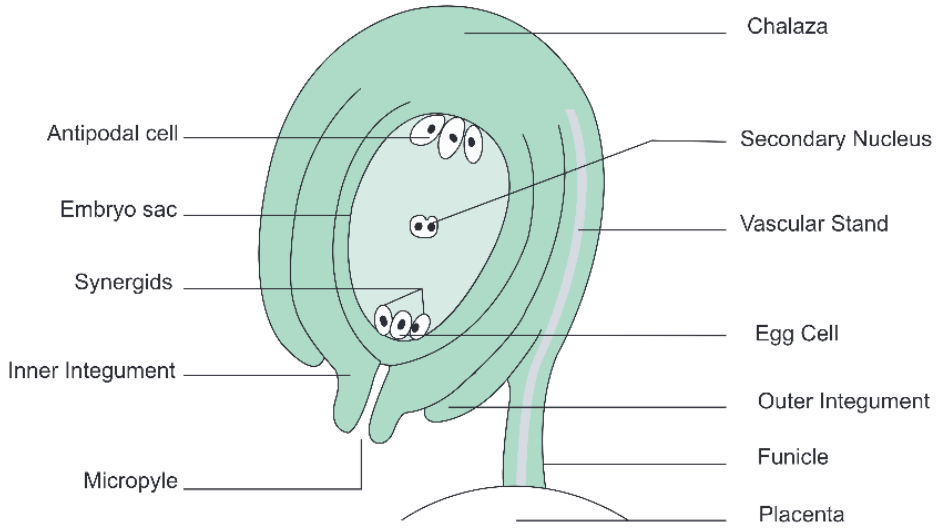
- ***Stamen*** – pollen-producing part of a flower
  - □ ***Filament*** – stalk portion of the stamen
  - □ ***Anther*** –structure in which microsporangia forms microspores
- ***Carpel*** – megaspores and female gametophytes, all the carpels taken together are referred to as the ***pistil***
  - □ ***Stigma*** – tip of the carpel that receives the pollen
  - □ ***Style*** – leads from the stigma to the ovary
  - □ ***Ovary*** – contains the ovules
- ***Nectary*** – gland of flowering plants that secretes sugary solution, ***nectar***, located within or outside the flower

EXAMPLE:



- ***Ovule*** – structure that contains the megaspore, develops into seed after fertilization
  - □ ***Integument*** – outer protective layer made of sporophyte tissue
    - ***Micropyle*** – opening at apex of integument

EXAMPLE:

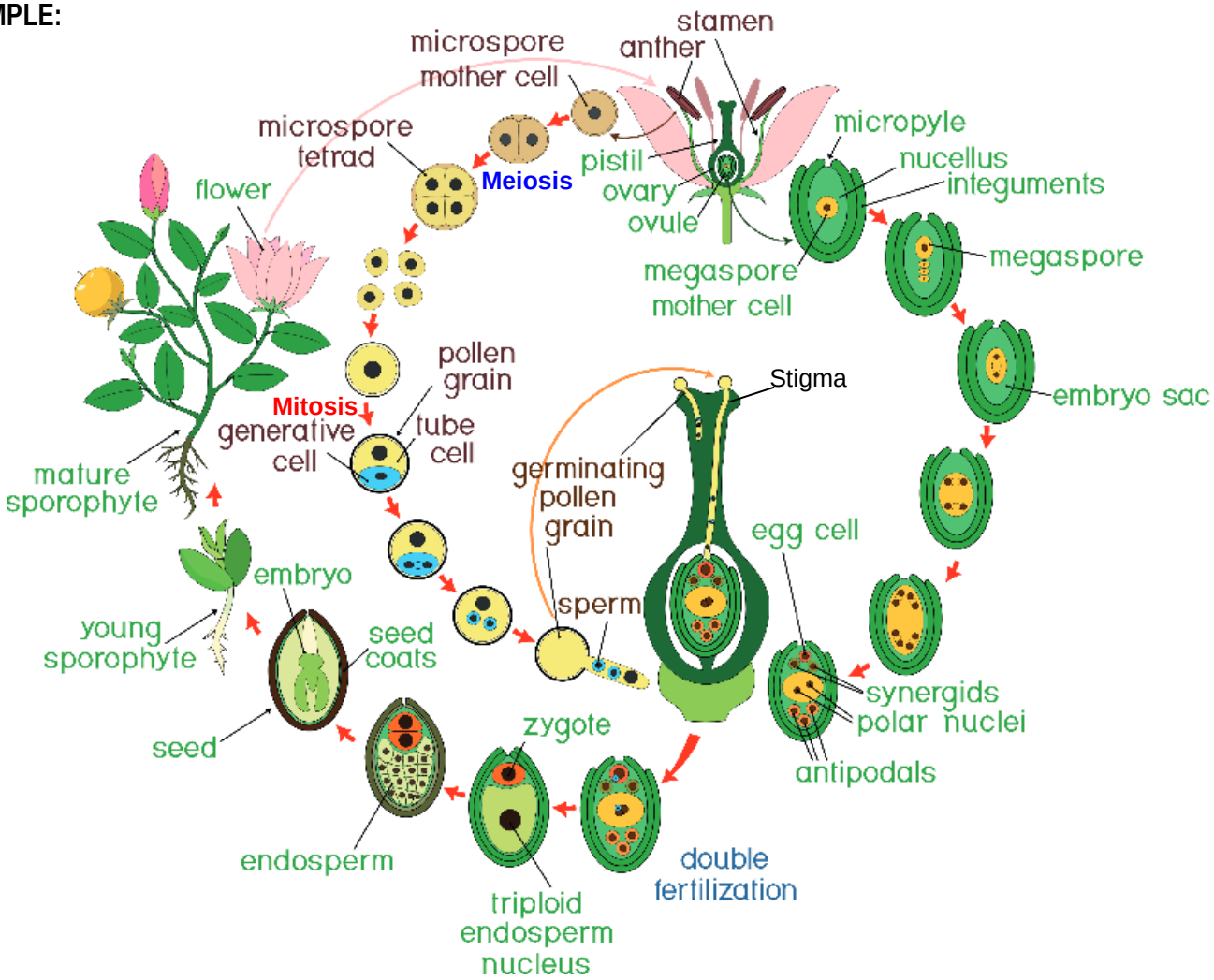


Structure of ovule

CONCEPT: ANGIOSPERM REPRODUCTION

- ***Pollen*** – male gametophyte surrounded by sporopollenin coating, contains generative and tube cells
  - □ Microsporocyte (2n) microspore (n) microgametophyte 2(n)
- ***Embryo sac*** – haploid female gametophyte contained in the ovule, develops into embryo
  - □ Megasporocyte (2n) megaspores 4(n), 3 degenerate and 1 megagametophyte 8(n)
  - □ Polar nuclei – 2 haploid nuclei that develop into endosperm
- ***Pollination*** – transfer of pollen to the ovule
  - □ ***Germination*** – pollen grain resumes growth and tube cell generates a pollen tube
  - □ ***Pollen tube*** – grows from male gametophyte through style, connects to ovule to transmit male gametes
- ***Double fertilization*** – pollen tube releases 2 sperm, 1 fertilizes the egg forming the embryo, other leads to endosperm
  - □ Generative cell divides by mitosis to produce male gametes (sperm)
  - □ ***Endosperm*** – tissue surrounding embryo in seed that provides nutrition via starch, protein, and oil
- ***Seed*** – develops from fertilized ovule, contain embryonic plant surrounded by protective coat

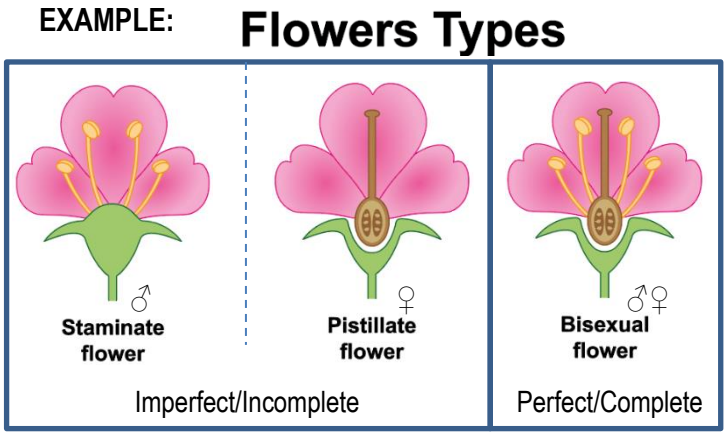
EXAMPLE:



CONCEPT: ANGIOSPERM REPRODUCTION

- ***Complete flowers*** – contain sepals, petals, stamen, and pistils
- ***Incomplete flowers*** – those missing some component
- ***Perfect flower*** – have stamen and pistil structures within the same flower, bisexual
- ***Imperfect flower*** – have stamen or pistils, unisexual flower
    - □ ***Monoecious*** – unisexual flowers, but male and female floral organs found on the same plant
    - □ ***Dioecious*** – unisexual flowers, male and female floral organs found on different plants

EXAMPLE:



- ***Cross-pollination*** – pollen transfers from anther of one plant, to stigma of another, though some plants ***self-pollinate***
- ***Self-incompatibility*** – genetically controlled mechanisms that prevent self-pollination, and encourages outcrossing
    - □ ***Outcross*** – breeding genetically unrelated individuals
- Temporal separation – male and female gametophytes mature at different times
- Spatial avoidance – spatial positioning of male and female flowers, or floral organs, to avoid self-pollination
- ***Pollination syndrome*** – flower traits that have evolved in response to pollen vectors like wind, bees, and birds
    - □ Mutualism – symbiosis beneficial to both organisms, animal pollinators get food in exchange for pollination
    - □ Coevolution – influence of species on each other evolution, many pollinators and flowers coevolved

EXAMPLE: